1931

Soil fertility investigations, sugar cane district of Louisiana

M O'Neal

SOIL FERTILITY INVESTIGATIONS SUGAR CANE DISTRICT OF LOUISIANA

Effect of nitrogen on sugar cane, Mandalay Field, Houma, Louisiana
Season of 1930

60 pounds of nitrogen per acre	Unfertilized
33.0 tons sugar cane per acre	19.6 tons of sugar cane per acre

LOUISIANA AGRICULTURAL EXPERIMENT STATION
Baton Rouge, La.

SOIL FERTILITY INVESTIGATIONS SUGAR CANE DISTRICT OF LOUISIANA

BY

A. M. O'Neal, of the Division of Soil Fertility Investigations, Bureau of Chemistry and Soils and Sim J. Breaux, Jr., of the Louisiana Agricultural Experiment Station

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Oswald Schreiner, Chief, Division of Soil Fertility Investigations, Bureau of Chemistry and Soils
L. A. Hurst, in charge U. S. Soil Fertility Investigations, Sugar Cane Soils of Louisiana

C. T. DOWELL, Dean and Director

W. G. TAGGERT, Assistant Director

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INTRODUCTION

The study of the sugar cane soils of Louisiana that is being conducted by the Division of Soil Investigations, U. S. Bureau of Chemistry and Soils in co-operation with the Louisiana Agricultural Experiment Station was planned to furnish the farmers with fundamental facts regarding the needs of their different soil types.

The co-operative field work was started February 5, 1929, and in the following pages all the data pertaining to the different projects are given. Fertility test fields have, up to the present time, been located only on the more extensively developed soils but it is hoped will eventually include the dominant soil types of each of the principal soil areas.

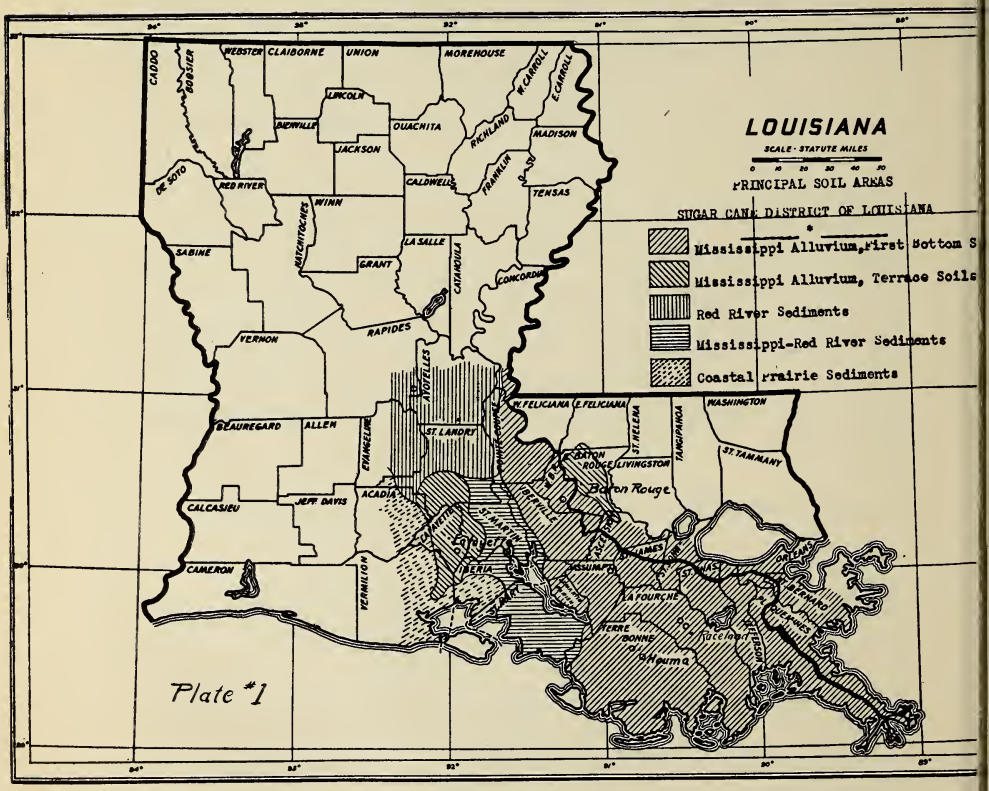
During the early part of the growing season a drought prevented the sugar cane from making as favorable growth as usual. Heavy rains throughout the latter part of the season retarded maturity, All experiments were harvested under favorable weather conditions and the results can be accepted as authentic. IT MUST BE REMEMBERED THAT THESE RESULTS REPRESENT ONLY ONE YEAR'S EXPERIMENTS AND THE BEST MIXTURES MAY VARY SLIGHTLY UNDER DIFFERENT SEASONAL CONDITIONS.

RECONNAISSANCE SURVEY AND PRINCIPAL SOIL AREAS

The reconnaissance survey of the Sugar Cane District of Louisiana was undertaken to determine the extent and distribution of the principal soil areas and the dominant soil types of each. All parts of the cane belt were visited and a great number of borings and pits were made to study the characteristics of the different soils. The soil surveys that had been made by the Division of Soil Survey, U. S. Bureau of Chemistry and Soils, of various parishes were of great help in the work.

The soils of the Sugar Cane District of Louisiana are practically all alluvial in origin. In the days before the protecting levees were built the Mississippi and its tributaries flooded this section periodically. Vast amounts of sediments eroded from the fertile fields further north were deposited according to the whims of the flood waters. Bordering the watercourses and where the currents were swiftest the heavier materials, sand and coarse silt,

were dropped whereas back from the channels the stagnant waters gave up their burden of silt and clay. But the clay, silt and sand did not always come from the same part of the watershed and the overflows were often local so that the sediments differ from place to place, depending upon the methods of deposition and the locality from which the alluvium was eroded. On the basis of dominant soil characteristics, therefore, the district has been sep-



arated into five major soil divisions: (1) Mississippi Alluvium, First Bottom Soils; (2) Mississippi Alluvium, Terrace Soils; (3) Red River Sediments; (4) Mississippi-Red River Sediments; and (5) Coastal Prairie Sediments of the Gulf Coastal Plain. Plate 1.

MISSISSIPPI ALLUVIUM, FIRST BOTTOM SOILS: The greater part of the Sugar Cane District of Louisiana falls within the limits of the first major division, Mississippi Alluvium, First

Bottom Soils or includes that part of Louisiana east and south of a line drawn from Morgan City north along the Atchafalaya River to Simmsport, down the east side of the Mississippi to the vicinity of Plaquemine then east to Lake Pontchartrain. The soils are of recent origin and represent, for the most part, alluvium brought down by the Mississippi and its tributaries. Even at the present time the lower sections are receiving sediments from the overflow waters of the smaller streams and from colluvial wash. The most extensively developed soils belong to the Yazoo and Sharkey series or groups of soils.

Yazoo Series: The soils of the Yazoo series are gray, grayish brown to light brown. The subsoils usually consist of a succession of light and heavy textured horizons or layers of a gray or mottled gray, rust brown and pale yellow color. Bluish casts are not uncommon in the heavier layers. Small lime concretions sometimes occur in the subsoil and the dominant soil reaction range is from neutral to alkaline. These soils, locally known as "Sandy Lands," usually occupy the front lands bordering the watercourses. Along the Mississippi River the Yazoo very fine sandy loam is the most extensive type and often extends back from 1 to 2½ miles before it merges with the heavier types. Along the bayous and smaller streams the strips are much narrower. The Yazoo soils occupy higher elevations than the Sharkey and have better drainage. The soils of this series can be handled under wide moisture conditions and their fertility can be easily improved by proper cultural methods.

Sharkey Series: Throughout the lower parts of the bottoms, back nearer the swamps, the soils of the Sharkey series, locally known as "Black Land," predominate. The surface soils are brown to dark brown with gray to bluish gray subsoils that are usually mottled with gray, rust brown and yellow. Drainage is poor and the ground water table is, as a rule, near the surface. These soils are difficult to handle and must be plowed under proper moisture conditions. Clods when exposed to the sun and rain break down into a granular mass. The soils are high in colloidal or extremely fine material and the heavier types have a tendency to run together.

MISSISSIPPI ALLUVIUM, TERRACE SOILS: This soil area consists of two developments, one in the vicinity of Lafayette,

which covers the greater part of Lafayette Parish, and the southwestern quarter of St. Landry and the other on the east side of the Mississippi River at Baton Rouge. The general level of these terraces is from 15 to 25 feet above the normal level of the first bottoms. The most extensively developed soils belong to the Lintonia and Olivier series.

Lintonia Series: The surface soils of the Lintonia series are brown to dark brown underlain by heavier textured subsoils of a brown, yellowish brown to pale yellow color. The most extensive type is the silt loam. It has an acid reaction with a range of medium to slightly acid for the surface soil. Drainage is excellent. While the subsoils are retentive of moisture, the top layers dry quickly, a condition that could be improved by the incorporation of green manures.

Olivier Series: The Olivier series has dark brown to dark grayish-brown surface soils and gray or drab subsoils mottled with rust brown and yellow. Small iron concretions occur on the surface and throughout the soil layer. Drainage is not as well established as on the Lintonia silt loam and tiling and open ditches would prove of great help. The soil is not as retentive of moisture as the Lintonia and the sugar cane suffers from drought much earlier in the season. The soils have much the same reaction as the Lintonia silt loam or acid to almost neutral.

RED RIVER SEDIMENTS: North of an imaginary line drawn east and west through Washington or north of Bayou Courtableau the country presents a very different appearance from that to the south. The soils have a reddish cast and plowed fields when wet are brick red to pinkish red. The soils are derived from the Red River sediments that have come down during periods of flood from the Permian Red Beds. Throughout the limited area devoted to the production of sugar cane only first bottom soils occur. The Yahola and Miller series predominate with the Yahola very fine sandy loam occupying the largest total area.

Yahola Series: The soils of the Yahola series are characterized by reddish brown to pinkish red surface soils. The subsoils consists of interbedded layers of varying textures ranging from very fine sandy clay to loamy fine sand. The color of these layers is much the same as that of the surface though light gray mottles occur in the lower part of the three foot section. Both the soil

and subsoil show an alkaline reaction. The soils occupy first bottom positions and while many of the fields show good drainage, the type as a whole could be improved by open ditches and tiles. The soils are easy to handle and may be maintained in a high state of productivity by the use of suitable cultural methods.

Miller Series: The surface soils of the Miller series are brownish red to reddish brown underlain by chocolate red to pinkish red heavier textured subsoils. They differ from the Yahola in that the subsoils are not laminated but uniformly heavy. Drainage is somewhat better established. Both soil and subsoil give an alkaline reaction.

MISSISSIPPI-RED RIVER SEDIMENTS: If a line is drawn from Morgan City north along the Atchafalaya River to Krotz Springs, west to the terrace section at Port Barre, south through Cade, Lydia and Glenco, it will outline roughly a section where the soils show an entirely different influence from those east of the Atchafalaya. A close study has shown to date that the sediments are not the same, a fact that has been substantiated by the history of that section. Back in years past it appears that the Teche served as an outlet for the flood waters of the Red River and during periods of overflow deposited sediments burying the original soils, soils that had already reached different stages of development. The result is a section possessing different soil characteristics. Two important groups of soils have been studied to date. These soils have been classified as Pharr and Franklin series.

Pharr Series: The surface soils of the Pharr series are dark gray to dark grayish brown underlain by a grayish brown to almost black heavier textured layer that usually has a thickness of 9 to 12 inches. The true subsoil is a dark gray to gray compact, heavy clay highly mottled with rust brown, yellow and yellowish brown.

Franklin series: The Franklin series has light brown to grayish brown surface soils and mottled gray, yellowish brown and rust brown subsoils. The subsoils usually consists of interbedded light and heavy textured layers but the differences in texture are not as pronounced as in the Yazoo. The subsoils are consistently heavier than the Yazoo and show a different pH reaction.

COASTAL PRAIRIE OF GULF COASTAL PLAIN: A low level plain made up of marine or oceanic deposits occurs west of an imaginary line drawn through the eastern part of Acadia Parish, the western section of Lafayette, the eastern part of Vermilion and the central part of Iberia Parish. Along its western boundary it merges imperceptibly with the terrace section of the Mississippi basin. The general level is below that of the terrace and the section, as a whole, has poor drainage. The principal soil series of the limited section studied are the Crowley and Lake Charles.

Crowley Series: The soils of the Crowley series consists of brown to grayish brown top layers underlain at 7 to 9 inches by a light gray rather pulvurulent horizon. The subsoil is moderately tough, plastic clay of a dark drab to dark gray color mottled with red, reddish yellow, yellowish brown and yellow. Typically the red mottles increase with depth and the texture becomes somewhat lighter. Surface drainage is good but the subsoil is poorly drained and shows the lack of thorough aeration.

Lake Charles Series: The surface soils of the Lake Charles series are dark brown to very dark grayish brown. The subsoils are heavy and range in color from dark brown mottled with gray, rust brown and yellow to mottled gray and yellow. The yellow mottles usually increase with depth. The subsoils are highly calcareous and a concentration of lime concretions occurs at from 22 to 28 inches below the surface. The surface of this soil is flat to gently sloping and natural drainage is poor.

WEATHER RECORDS, SEASON OF 1930

The weather records for the season of 1930 show that January was exceedingly wet over the entire district with Cinclare giving the highest precipitation and Bunkie the lowest. The mean temperatures for March, at each of the weather stations, are lower than for February which was reflected in the low germination of the sugar cane. In April and May the high mean temperatures caused rapid succering but the lack of moisture during the months of May and June prevented normal growth. Except at the Mandalay Field, near Houma, where a light rain fell immediately after the fertilizer had been applied, very little response to fertilizers was

observed until the last of June or first of July. During August and September which normally is a period when sugar cane starts to mature, high precipitation and fairly high temperatures encouraged growth even up to harvest.

The temperature and precipitation data at Houma, Lafayette, Cinclare and Bunkie, points at widely separated sections of the sugar cane district of Louisiana, are given in Tables 1 to 4.

TABLE 1

LAFAYETTE

(Year of 1930)

Month	TEMPERATURE			Rainfall Inches	Number of Precipitation
	Max.	Min.	Mean		
January	61.4	42.1	51.8	8.68	9
February	72.2	50.0	61.1	4.29	9
March	67.8	47.9	57.8	3.27	12
April	84.8	57.9	70.2	1.37	4
May	85.2	66.3	75.8	3.58	9
June	93.4	66.1	79.8	.36	5
July	94.3	70.8	82.6	9.04	14
August	92.3	69.8	81.0	6.02	12
September	88.5	68.3	78.4	9.41	13
October	79.7	56.7	68.2	5.77	8
November	70.3	49.6	60.0	5.32	12
December	60.6	40.5	50.6	3.86	10

TABLE 2

HOUMA

Month	TEMPERATURE			Rainfall Inches	Number of Precipitation
	Max.	Min.	Mean		
January	56.9	44.1	50.6	8.88	4
February	67.1	50.1	58.6	2.84	5
March	63.3	49.5	56.3	3.16	10
April	76.7	55.2	66.0	3.03	3
May	79.8	66.3	73.0	1.20	1
June	84.0	65.1	74.4	.84	5
July	85.3	70.2	77.8	8.77	11
August	83.6	68.3	76.0	6.23	9
September	81.5	69.7	75.6	8.92	15
October	74.9	57.6	66.2	5.42	10
November	64.9	50.1	57.5	5.93	8
December	55.9	40.5	48.1	3.17	6

TABLE 3

CINCLARE

(Year of 1930)

Month	TEMPERATURE			Rainfall Inches	Number of Precipitation
	Max.	Min.	Mean		
January	60.7	41.9	51.3	10.21	8
February	70.6	48.0	59.3	2.72	7
March	65.9	47.7	56.8	5.16	11
April	79.6	56.5	68.0	1.83	4
May	82.8	65.7	74.2	6.34	7
June	91.5	66.5	79.0	0.00	0
July	94.4	69.9	82.2	6.02	10
August	92.4	68.6	80.5	5.30	12
September	87.5	67.6	77.6	7.10	12
October	80.0	55.0	67.5	2.40	6
November	70.6	47.9	59.2	6.86	12
December	60.2	38.5	49.4	2.79	7

TABLE 4

(Cheneyville)

BUNKIE

Month	TEMPERATURE			Rainfall Inches	Number of Precipitation
	Max.	Min.	Mean		
January	61.5	38.8	50.2	6.36	7
February	71.0	47.5	59.2	3.59	5
March	68.0	45.6	56.8	2.84	5
April	83.3	55.5	69.4	.63	3
May	83.5	64.6	74.0	4.54	6
June	93.0	64.1	78.6	.58	1
July	97.0	69.5	83.2	1.72	4
August	95.0	69.5	82.2	1.54	6
September	88.8	67.6	78.2	8.44	14
October	80.1	54.4	67.2	2.92	5
November	70.2	46.1	58.2	6.92	6
December	59.7	38.4	49.0	5.42	3

FERTILIZER TEST FIELDS

In undertaking the problem of sugar cane production in Louisiana it seems logical to determine the fertilizer requirements of each of the principal soil areas where the dominant soil characteristics are different. Such a study is necessarily slow due to the extent of the district and for the present includes only a few of the soils; Yazoo very fine sandy loam, Lintonia silt loam and Yahola very fine sandy loam. These soils are described on pages 7 and 8, respectively.

The 1930 program included nine fertility test fields situated at widely separated sections of the Sugar Cane District. Three of the 1929 experiments, located near Houma, Raceland and Bunkie, that remained in cane were continued and fertilized with five combinations of the principal plant food elements, nitrogen, phosphoric acid and potash at the following rates in pounds per acre: 40 pounds of nitrogen, 20 pounds of phosphoric acid and 20 pounds of potash; 40 pounds of nitrogen and 20 pounds of phosphoric acid; 40 pounds of nitrogen and 20 pounds of potash; 20 pounds of phosphoric acid and 20 pounds of potash; and 40 pounds of nitrogen. The tests at Houma and Raceland located on Yazoo very fine sandy loam (page 4) were replicated four times, whereas the Bubenzer Field, Bunkie, on Yahola very fine sandy loam (page 5) consists of one set of plots that run the entire length of the square. In addition to the above, six new fields were located near the following towns, Cinclare, Donaldsonville, Raceland, Houma and Lafayette. Five of these were laid out according to the Triangle System[a] or where 21 different mixtures of nitrogen, phosphoric acid and potash are applied at the rate of 60 pounds of plant food per acre. The sixth field consists of a rate and source study where 20, 40, 60 and 80 pounds of nitrogen from the carriers Ammonium Sulphate, Cyanamid, Calcium Nitrate, Calurea and Nitrate of Soda were replicated twice. With the exception of the field near Lafayette which was located on Lintonia silt loam (page 8), all the new projects are located on Yazoo very fine sandy loam (page 7).

(a) The Triangle System of Fertilizer Experimentation is explained fully in an article by Oswald Schreiner and J. J. Skinner in Jour. Amer. Scc. of Agronomy, Vol. 10 ps 225-246. (1922).

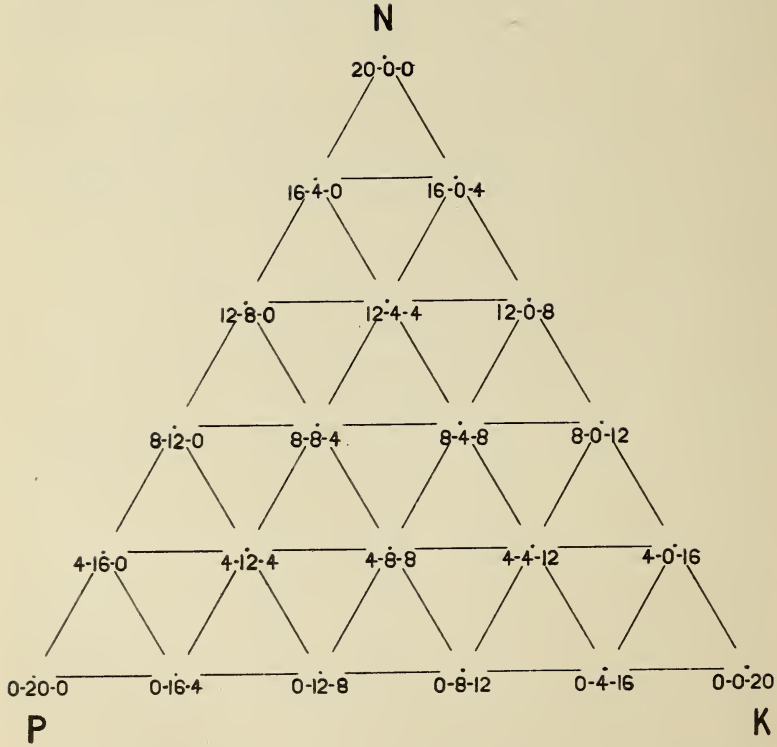


PLATE 2—Triangle diagram with points representing the 21 fertilizer combinations, expressed in percentages used in these experiments.

The five new fields were planned and laid out to study the effect of 21 different combinations of the three plant food elements: nitrogen, phosphoric acid and potash. The basis of interpretation of this system is an equilateral triangle, Plate 2, in which the extreme points represent the single elements nitrogen (N), phosphoric acid (P_2O_5) and potash (K_2O). In the triangle diagram nitrogen is placed at the top, phosphoric acid at the left and potash at the right. Each side of the triangle is divided into five equal parts and lines drawn connecting these points. The points of intersection represent the fertilizer mixtures used on the plots.

In Plate 2 the points on the line forming the base of the triangle represent the mixtures containing no nitrogen. The sides, in like manner, represent mixtures free of phosphoric acid and potash. Moving from the base toward the apex each succeeding parallel line represents a 4 per cent increase in nitrogen whereas the lines parallel to the sides show corresponding 4 per cent increaments of phosphoric acid and potash. In other words the points inside the triangle represent complete fertilizer mixtures.

In order to facilitate the interpretation of the results the yields of sugar and the tons of sugar cane per acre are shown on diagrams similar to Plate 2.

An examination of the analysis given in Plate 2 shows that each of the mixtures add to a total of 20 per cent but no two are alike. In other words each plot received the same number of pounds of plant food constituents, but each received a different ratio.

All fertilizer formulas in this publication are stated in the following order: nitrogen, phosphoric acid and potash. The source of the different plant food constituents are: nitrogen from nitrate of soda, phosphoric acid from superphosphate and potash from muriate of potash.

FIELD PROCEDURE

In the spring of 1930 sites for the fertilizer test fields were selected with the following points in mind: importance of the soil to be studied, uniformity of soil type and regularity of sugar cane stand. At each location a great number of borings were made, with a three foot soil auger, to determine if all soil characteristics were sufficiently uniform. In no case was the fertilizer applied unless the stand of sugar cane was healthy and uniform. The plots were designed and laid out so that in all cases a four row heap, protected on each side by buffers that had received the same mixtures, would give approximately one good wagon load. The average size of plots was 8 rows wide and 110 feet long.

The fertilizer was applied in the spring by hand. It was broadcast over the loose dirt near the off-barred furrow so that when this dirt was thrown back to the cane it would be thoroughly mixed with the top soil that would first receive the new roots. Application was made under the personal supervision of the authors. In the case of the Bubenzer Field the fertilizer was applied with a single row drill which was calibrated for each mixture.

During the growing season periodical observations were made and in order that the knowledge of the mixtures might not influence notations, the plots were numbered serially.

Samples of sugar cane from each plot of the various test fields were collected within a ten-day period and trucked to the Houma Station where they were ground and analyzed within 24 hours after being cut. The mill setting remained uniform during this period. Great care was exercised in collecting the samples from the plots and this operation was personally supervised. With the average condition of each plot in mind, random stools were selected from which equal numbers of good, medium and bad canes were selected in the proportion in which they occurred. This procedure continued until 60 to 80 pounds of sugar cane had been cut. The canes were then carried to the headland where they were stripped and topped by the same man, tied in bundles and tagged.

The cutting and weighing of the plots followed immediately upon completion of the mill analysis. Only the four middle rows of each plot were harvested thus leaving two buffer rows to take care of any carry over effect.

SUGAR CALCULATIONS

The 96 per cent sugar per ton of sugar cane was calculated by the Winter-Carp formula (d).

$$X = \left| \frac{S\left(1.4 - \frac{40}{P}\right)}{.96} \right| - 20$$

Where X = Pounds of 96 per cent sugar per ton of cane
S = Per cent sucrose in crusher juice
P = Purity of crusher juice

The following factors being included in the calculations (d)

78 per cent—Extraction
100 per cent—Boiler house efficiency
.92 per cent—Observed sucrose—Normal sucrose
.954 per cent—Observed brix—Normal brix

(d) U. S. D. A. Circular No. 418 R. D. Rands and S. F. Sherwood.

CINCLARE FIELD

Cinclare, La.

TABLE 5—Effect of the different ratios of plant food elements applied at the rate of 60 pounds of plant food constituent per acre, on P.O.J. 36 2nd. year stubble cane.

Fertilizer N P K	Station Mill Analyses			Tons Cane Per Acre	Pounds Sugar Per Ton	Pounds Sugar Per Acre	Rank
	Brix	Sucrose	Purity				
20– 0– 0	15.80	12.57	79.56	16.0	165.0	2,640	10
16– 4– 0	14.57	10.80	74.13	18.6	135.7	2,524	11
16– 0– 4	13.70	9.44	68.91	16.0	112.6	1,802	18
12– 8– 0	14.47	10.48	72.42	18.7	129.6	2,424	12
12– 4– 4	14.57	10.65	73.10	20.0	132.7	2,654	9
12– 0– 8	15.60	12.47	79.94	18.0	164.2	2,956	4
8–12– 0	15.27	11.68	76.49	21.0	149.8	3,146	3
8– 8– 4	14.80	11.03	74.53	19.5	139.1	2,712	6
8– 4– 8	15.40	12.76	82.86	15.8	173.6	2,710	7
8– 0–12	13.97	9.86	70.58	15.0	120.1	1,802	18
4–16– 0	14.37	10.58	73.63	15.0	132.0	1,980	13
4–12– 4	15.00	11.61	77.40	29.0	149.9	4,347	1
4– 8– 8	14.90	12.01	80.61	17.0	158.9	2,701	8
4– 4–12	15.33	11.95	77.95	12.0	155.3	1,864	15
4– 0–16	15.50	12.89	83.16	17.0	173.6	2,951	5
0–20– 0	14.80	11.03	74.53	11.5	139.1	1,600	21
0–16– 4	14.27	10.35	72.53	14.2	128.2	1,820	17
0–12– 8	14.60	11.42	78.22	13.0	148.4	1,929	14
0– 8–12	14.17	10.32	72.83	25.0	128.2	3,205	2
0– 4–16	14.87	11.41	76.73	11.0	146.5	1,611	20
0– 0–20	14.67	11.12	74.77	13.0	141.6	1,841	16
Average of four Check Plots	14.77	11.21	75.89	12.5	143.1	1,789	19

Fertilizer applied April 29th, 1930. Sugar cane harvested December 1st and 2nd, 1930.

CINCLARE FIELD

Yazoo Very Fine Sandy Loam

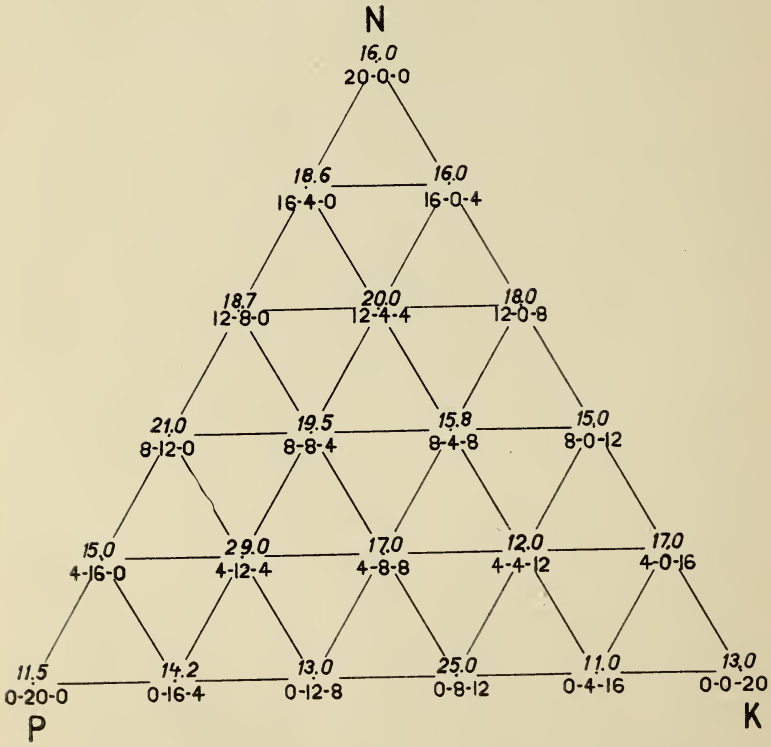


PLATE 3—Tons of cane per acre. Average of check plots 12.5 tons.

CINCLARE FIELD

Yazoo Very Fine Sandy Loam

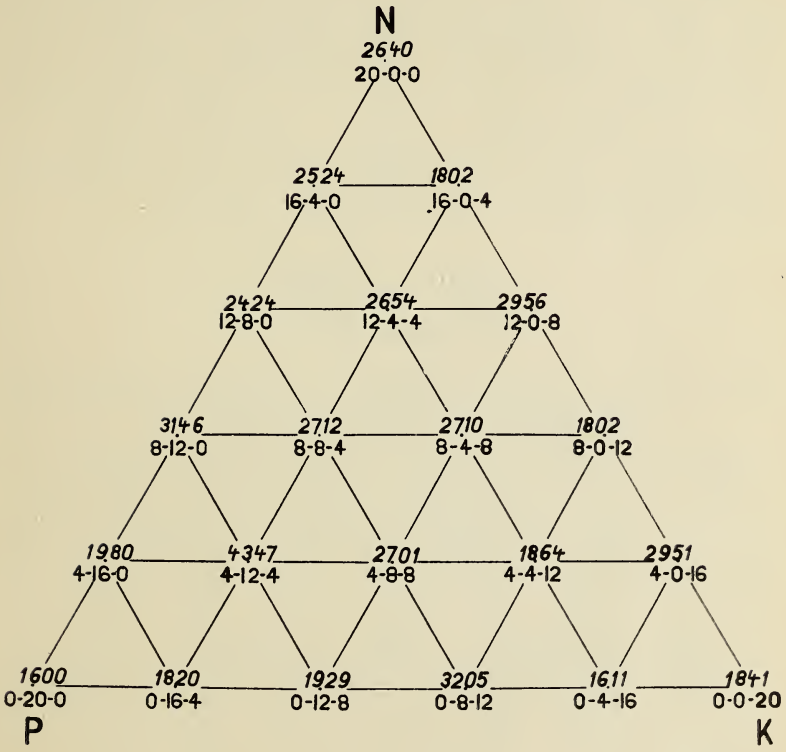


PLATE 4—Pounds of sugar per acre. Average of check plots 1,789 pounds.

In Table 5 are given the results obtained with sugar cane during the season of 1930 whereas Plates 3 and 4 show graphically the yields in tons and sugar per acre.

In Plate 3 it will be noticed that the 4-12-4 plot made the highest yield. The 8-12-0 and 8-8-4 gave moderately high returns

whereas all the points on the 12 per cent nitrogen line are consistently high. With the exception of the 0-8-12 plot all the nitrogen free mixtures gave low yields.

The yields in sugar per acre, Plate 4, shows practically the same trend as tonnage. The 4-12-4 plot gave the highest yield whereas the 8-12-0 was third. The mixtures containing 12 per cent of nitrogen are consistently high but the highest point of the line is plot 12-0-8 instead of 12-4-4. The 0-8-12 plot gave the second highest yield but when compared with the other nitorgen free mixtures which are low is apparently out of line.

BELLE TERRE FIELD

Donaldsonville, La.

TABLE 6—Effect of the different ratios of plant food elements applied at the rate of 60 pounds of plant food constituents per acre, on P.O.J. 213 1st. year stubble cane.

Fertilizer N P K	Station Mill Analyses			Tons Cane Per Acre	Pounds Sugar Per Ton	Pounds Sugar Per Acre	Rank
	Brix	Sucrose	Purity				
20– 0– 0	14.31	10.48	73.24	31.3	130.9	4,097	2
16– 4– 0	14.91	12.01	80.55	22.2	158.9	3,528	12
16– 0– 4	15.38	12.47	81.08	25.5	165.6	4,223	1
12– 8– 0	14.88	11.56	77.69	23.8	149.6	3,560	11
12– 4– 4	15.21	12.05	79.23	23.3	157.9	3,679	9
12– 0– 8	14.51	11.34	78.45	21.8	147.4	3,213	14
8–12– 0	15.51	12.59	81.18	22.2	167.4	3,716	7
8– 8– 4	15.61	12.76	81.74	22.2	170.3	3,780	5
8– 4– 8	14.31	10.83	75.68	26.9	138.0	3,712	8
8– 0–12	16.18	13.76	85.04	21.7	187.5	4,069	3
4–16– 0	14.71	11.36	77.23	19.5	146.6	2,859	18
4–12– 4	15.21	12.35	81.20	22.9	164.2	3,760	6
4– 8– 8	15.58	12.91	82.87	21.2	173.2	3,672	10
4– 4–12	15.81	13.15	83.18	22.5	177.2	3,987	4
4– 0–16	15.11	12.00	79.42	18.2	157.4	2,865	17
0–20– 0	15.21	12.15	79.88	20.4	160.0	3,264	13
0–16– 4	15.91	13.35	83.91	16.0	180.7	2,891	16
0–12– 8	15.36	12.56	81.78	16.5	167.8	2,769	19
0– 8–12	15.21	12.42	81.66	16.3	165.6	2,699	21
0– 4–16	15.41	12.44	80.73	18.8	164.8	3,098	15
0– 0–20	15.41	12.64	82.03	14.9	169.0	2,518	22
Average of six Check plots.....	15.16	12.24	80.74	16.6	163.0	2,706	20

Fertilizer applied April 14th, 1930. Sugar Cane harvested December 5th and 6th, 1930.

BELLE TERRE FIELD

Yazoo Very Fine Sandy Loam

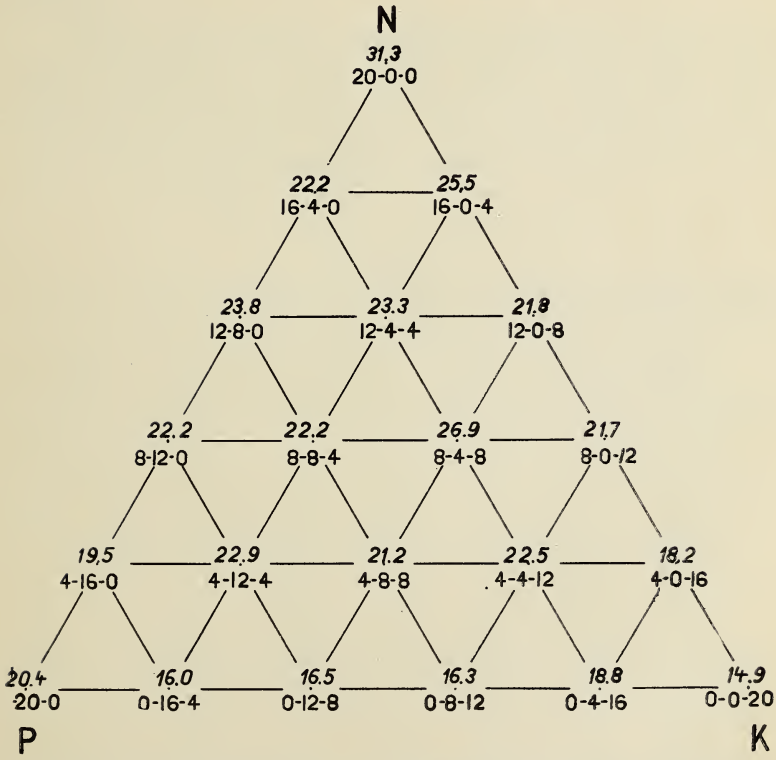


PLATE 5—Tons of cane per acre. Average of check plots 16.6 tons.

BELLE TERRE FIELD

Yazoo Very Fine Sandy Loam

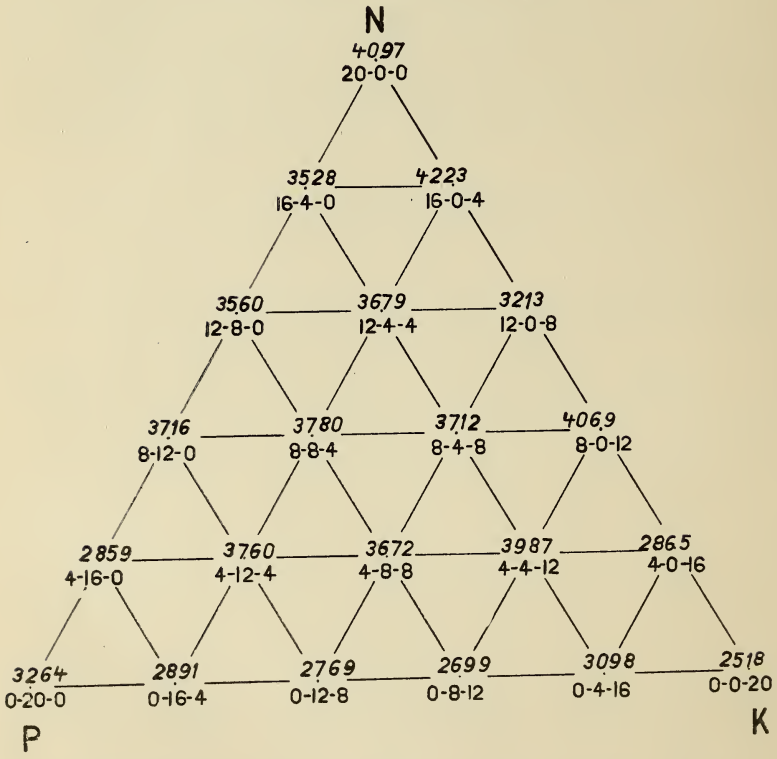


PLATE 6—Pounds of sugar per acre Average of check plots 2,706 pounds.

The results for the Belle Terre Field, located near Donaldsonville, Louisiana, are given in Table 6 and shown graphically in Plates 5 and 6.

The greater number of high yielding plots, Plate 5, tend to group themselves around plot 8-4-8 which shows a tonnage of 26.9. It is interesting to note that the high nitrogen plot, 20-0-0, gave an even greater yield, 31.3 tons, and that the increase along the nitrogen-potash line is steady with each 4 per cent nitrogen increment.

In Plate 6 the center of the greatest number of high yielding plots is at plot 8-8-4 though three plots of even higher yields occur on the nitrogen-potash line at 8-0-12, 16-0-4 and 20-0-0. The yields on the nitrogen-potash line are consistently higher than those on the nitrogen-phosphoric acid line.

UPPER TEN FIELD

Raceland, La.

TABLE 7—Effect of the different ratios of plant food elements applied at the rate of 60 pounds of plant food constituent per acre, on P.O.J. 213 1st year stubble cane.

Fertilizer N P K	Station Mill Analyses			Tons Cane Per Acre	Pounds Sugar Per Ton	Pounds Sugar Per Acre	Rank
	Brix	Sucrose	Purity				
20– 0– 0	14.49	11.61	80.13	27.4	153.0	4,192	5
16– 4– 0	13.46	9.88	73.40	26.3	123.6	3,251	16
16– 0– 4	15.49	12.86	83.02	26.1	172.8	4,510	2
12– 8– 0	14.96	12.20	81.55	26.7	162.6	4,341	4
12– 4– 4	16.29	13.92	85.45	27.0	190.2	5,135	1
12– 0– 8	13.83	10.29	74.41	29.0	129.8	3,764	8
8–12– 0	15.53	11.00	70.84	24.0	133.8	3,211	17
8– 8– 4	14.36	11.24	78.27	23.4	146.1	3,418	12
8– 4– 8	14.87	12.15	81.71	27.0	162.1	4,376	3
8– 0–12	15.16	12.37	81.60	20.0	164.8	3,296	15
4–16– 0	15.56	13.04	83.81	20.4	176.4	3,599	9
4–12– 4	15.36	12.79	83.26	20.4	172.5	3,519	10
4– 8– 4	15.56	12.99	83.48	21.8	175.7	3,830	7
4– 4–12	15.79	13.35	84.55	18.9	181.4	3,428	11
4– 0–16	15.99	13.95	87.24	20.2	192.8	3,880	6
0–20– 0	15.46	12.86	83.18	19.2	173.3	3,327	14
0–16– 4	14.64	11.79	80.53	19.6	156.1	3,060	18
0–12– 8	15.26	12.40	81.26	18.0	164.9	2,968	19
0– 8–12	16.19	13.92	85.97	17.7	190.9	3,379	13
0– 4–16	15.44	13.01	84.26	14.6	176.6	2,578	21
0– 0–20	14.06	11.07	76.10	15.9	144.2	2,293	22
Average of 7 Check Plots.....	15.26	12.55	82.24	17.2	168.1	2,891	20

Fertilizer applied April 8th, 1930. Sugar cane harvested November 12th, 1930.

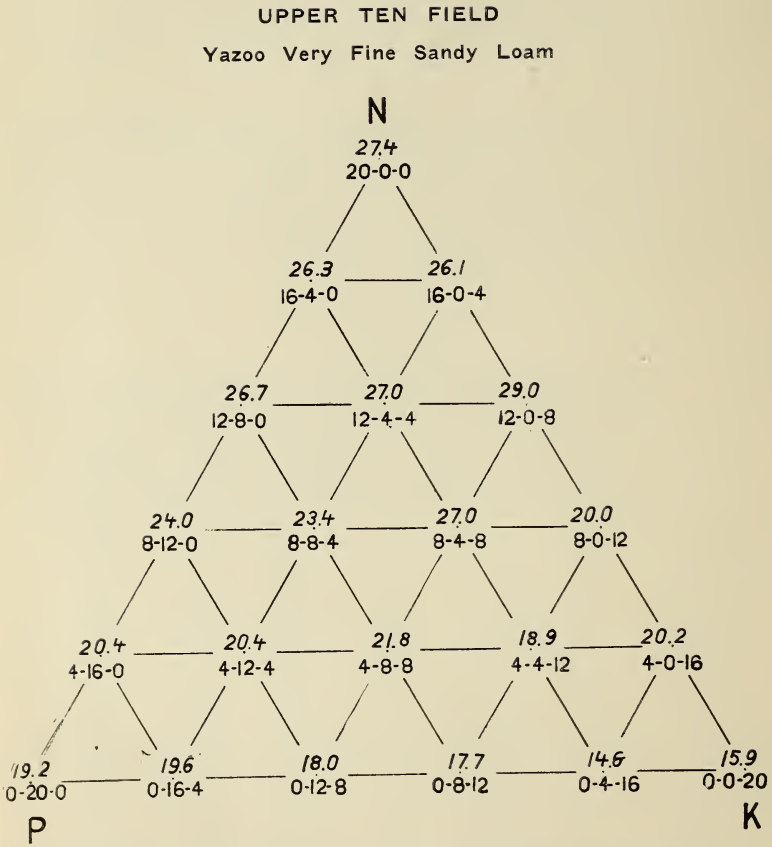


PLATE 7—Tons of cane per acre. Average of check plots 17.2 tons.

UPPER TEN FIELD

Yazoo Very Fine Sandy Loam

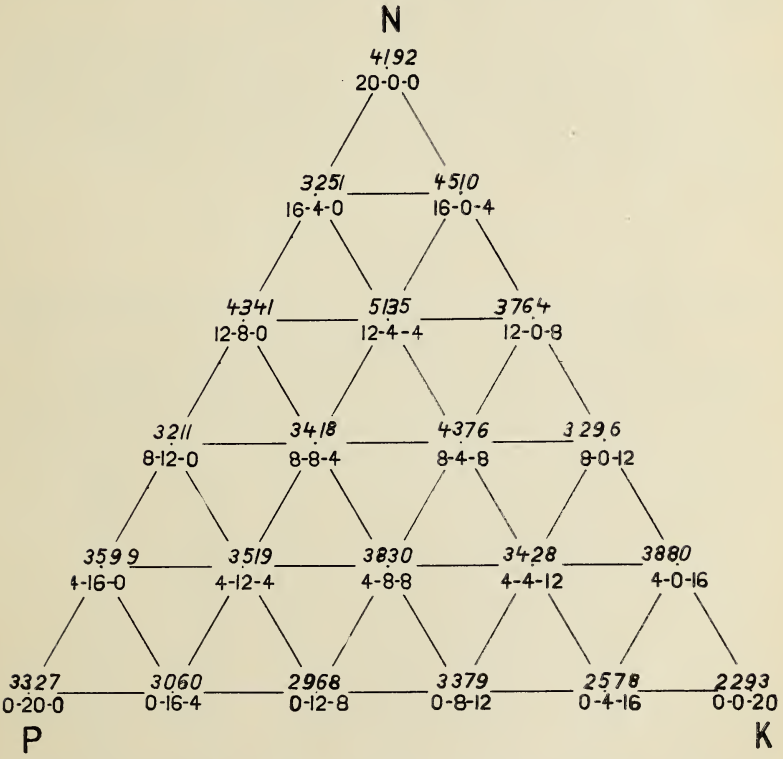


PLATE 8—Pounds of sugar per acre. Average of check plots 2,891 pounds.

The highest yields of sugar cane in tons per acre were produced by the high nitrogen mixtures found in the nitrogen end of the triangle, Plate 7. The main center of highest yields is located at the 12-0-8 plot, though the greater number of high yielding plots seem to group themselves more closely around the 12-4-4 point where the total yield is 2 tons less. The average yields in tons per acre of the phosphoric acid-potash line from the base to the apex are 17.4, 20.8, 23.8, 27.5, 26.2 and 27.4. This shows a steady increase up to the 12 per cent nitrogen line beyond which there is practically no change.

In Plate 8 which gives in graph form the pounds of sugar per acre, the high yielding plots group themselves definitely around the 12-4-4 plot or very near the nitrogen end of the triangle. The mixtures that contain no nitrogen gave rather consistenly low yields.

MANDALAY FIELD

Houma, La.

TABLE 8—Effect of the different ratios of plant food elements applied at the rate of 60 pounds of plant food constituent per acre, on P.O.J. 213 1st. year stubble cane.

Fertilizer N P K	Station Mill Analyses			Tons Cane Per Acre	Pounds Sugar Per Ton	Pounds Sugar Per Acre	Rank
	Brix	Sucrose	Purity				
20– 0– 0	14.50	11.05	76.21	33.0	141.3	4,663	11
16– 4– 0	15.75	12.92	82.04	31.8	172.5	5,486	3
16– 0– 4	15.10	12.07	79.94	30.6	158.9	4,862	9
12– 8– 0	15.73	13.05	82.96	33.2	175.6	5,830	1
12– 4– 4	16.44	14.10	85.77	29.2	193.3	5,644	2
12– 0– 8	15.72	12.47	79.33	30.2	163.5	4,938	7
8–12– 0	16.60	14.23	85.72	27.8	195.0	5,421	4
8– 8– 4	15.88	13.42	84.51	25.0	182.1	4,553	12
8– 4– 8	16.17	13.60	84.11	26.8	184.4	4,942	6
8– 0–12	16.27	13.85	85.12	27.3	188.9	5,157	5
4–16– 0	16.36	13.94	85.21	22.7	190.4	4,322	15
4–12– 4	16.57	14.15	85.39	23.1	193.6	4,472	14
4– 8– 8	16.33	14.01	85.80	25.4	192.1	4,879	8
4– 4–12	16.00	13.41	83.81	24.8	181.4	4,499	13
4– 0–16	16.26	13.79	84.81	25.7	187.8	4,826	10
0–20– 0	16.28	13.82	84.89	21.8	188.2	4,103	18
0–16– 4	16.33	13.83	84.69	22.6	188.2	4,253	17
0–12– 8	16.22	13.85	85.38	22.7	189.3	4,299	16
0– 8–12	16.17	13.53	83.67	22.0	183.0	4,026	19
0– 4–16	15.75	13.17	83.62	21.9	178.0	3,898	20
0– 0–20	16.42	13.90	84.65	20.6	189.2	3,898	20
Average of 14 Check Plots.....	16.11	13.56	84.17	20.8	183.9	3,825	21

Fertilizer applied April 10th and 11th, 1930. Sugar cane harvested November 24th and 25th, 1930.

MANDALAY FIELD

Yazoo Very Fine Sandy Loam

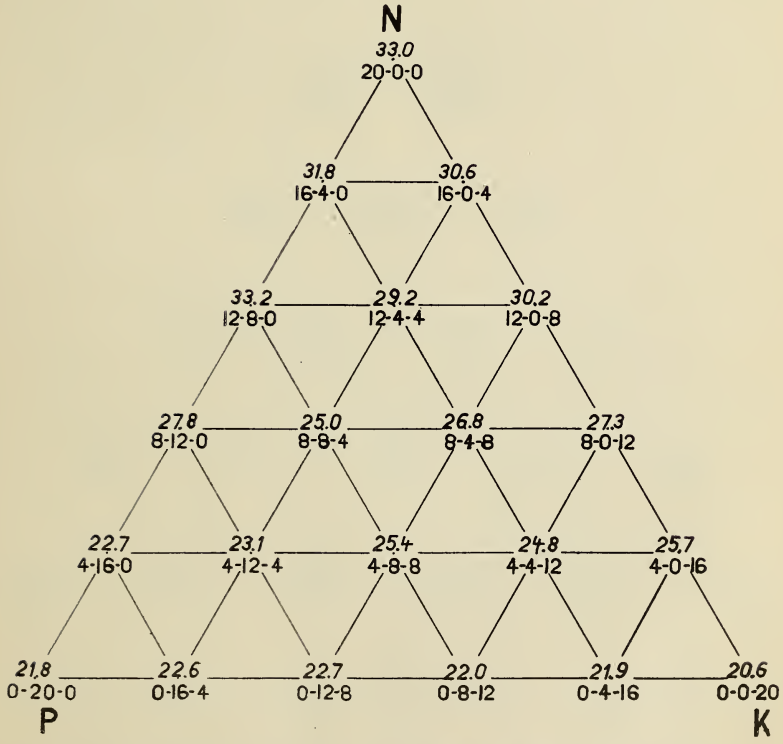


PLATE 9—Tons of cane per acre. Average of check plots 20.8 tons.

MANDALAY FIELD

Yazoo Very Fine Sandy Loam

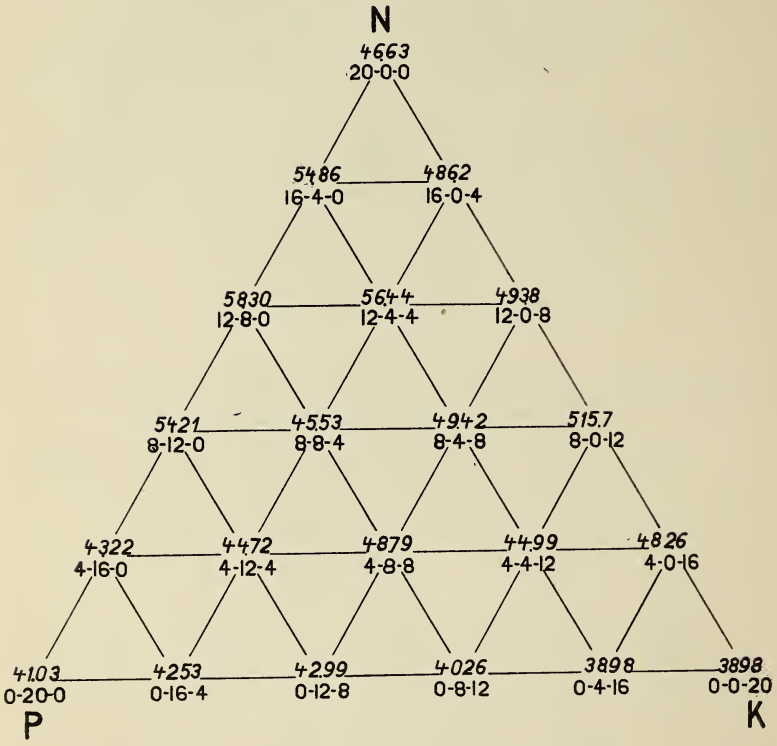


PLATE 10—Pounds of sugar per acre. Average of check plots 3,825 pounds.

In Table 8 are given all the data obtained at the Mandalay Test Field during the season of 1930 whereas Plates 9 and 10 show in graph form yields in tons of sugar cane per acre and pounds of sugar per acre, respectively.

In Plate 9 all the high yielding plots occur in the nitrogen end of the triangle. The 12-8-0 mixture made the greatest return. All the mixtures containing less than 12 per cent nitrogen gave low yields.

The yields in pounds of sugar per acre, Plate 10, gave a more definite trend. Most of the high yielding plots center around the 12-4-4 plot whereas the high yield is at the 12-8-0 plot. The low nitrogen and nitrogen free mixtures gave consistently low yields. It is interesting to note that an application of 60 pounds of nitrogen per acre produced 33 tons of sugar cane but only 4,663 pounds of sugar.

ROY FIELD

Lafayette, La.

TABLE 9—Effect of the different ratios of plant food elements applied at the rate of 60 pounds of plant food constituent per acre, on P.O.J. 213 1st year stubble cane.

Fertilizer N P K	Station Mill Analyses			Tons Cane Per Acre	Pounds Sugar Per Ton	Pounds Sugar Per Acre	Rank
	Brix	Sucrose	Purity				
20– 0– 0	15.29	12.18	79.66	33.2	160.0	5,312	1
16– 4– 0	15.80	13.30	84.18	29.4	180.3	5,300	2
16– 0– 4	15.59	12.91	82.81	28.8	173.4	4,994	3
12– 8– 0	15.35	12.49	81.37	26.6	166.2	4,421	6
12– 4– 4	15.20	12.18	80.13	26.5	160.6	4,256	8
12– 0– 8	15.33	12.49	81.47	28.7	166.3	4,773	4
8–12– 0	15.19	12.33	81.17	19.6	163.8	3,210	13
8– 8– 4	15.59	13.01	83.45	20.2	175.5	3,545	10
8– 4– 8	15.09	12.08	80.06	27.0	159.1	4,296	7
8– 0–12	15.49	12.61	81.41	27.5	167.8	4,614	5
4–16– 0	15.19	12.25	80.64	20.0	162.1	3,242	12
4–12– 4	15.59	13.04	83.65	17.1	176.1	3,011	15
4– 8– 8	15.59	12.84	82.36	16.6	172.0	2,855	16
4– 4–12	15.27	12.54	82.12	18.5	167.8	3,104	14
4– 0–16	15.69	13.18	84.01	21.8	178.5	3,891	9
0– 0–20	15.83	13.31	84.08	14.5	180.3	2,614	18
0–16– 4	15.39	12.76	82.91	13.8	171.5	2,367	22
0–12– 8	15.83	13.29	83.95	13.9	179.9	2,501	20
0– 8–12	15.57	12.96	83.24	14.4	174.7	2,516	19
0– 4–16	15.49	12.84	82.89	14.2	172.6	2,451	21
0– 0–20	15.59	13.01	83.45	20.0	175.5	3,510	11
Average of four Check Plots.....	15.25	12.57	82.42	16.8	168.5	2,831	17

Fertilizer applied May 2nd, 1930. Sugar cane harvested November 19th, 1930.

ROY FIELD

Lintonia Silt Loam

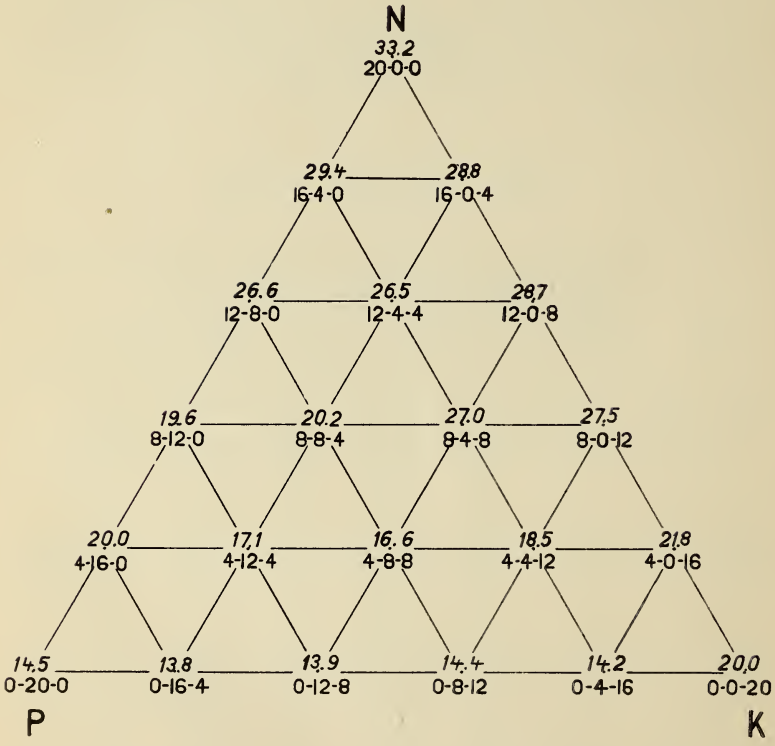


PLATE 11—Tons of cane per acre. Average of check plots 16.8 tons.

ROY FIELD

Lintonia Silt Loam

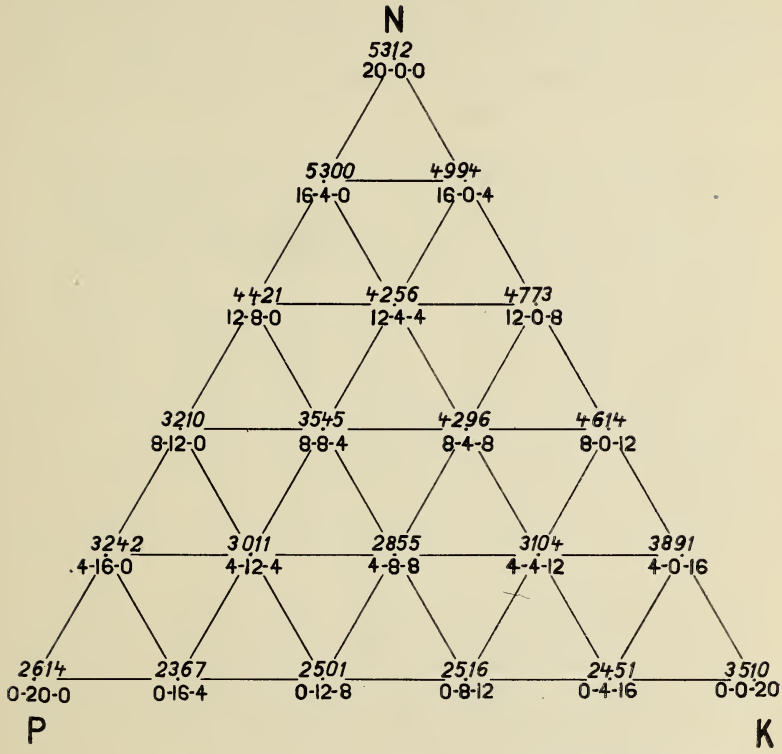


PLATE 12—Pounds of sugar per acre. Average of check plots 2,831 pounds.

In Plate 11 the tons of sugar cane produced on the Roy Test Field, Lafayette, Louisiana, are shown graphically whereas Plate 12 gives the pounds of sugar per acre. Table 9 gives the mill analyses, tons of sugar cane per acre, pounds of sugar per acre, and the rank of the different mixtures.

In Plate 11 the trend of the high yielding plots is very definitely towards the nitrogen end, plot 20-0-0. The greater number of high yields occur on the nitrogen-potash line, where no

phosphoric acid was used, the yield increasing as the nitrogen increased. There is one exception to this that is rather marked, namely, the second highest yield at the 16-4-0 plot.

The diagram showing pounds of sugar per acre, Plate 12, has practically the same trend as the tonnage. The greater number of high yielding plots are found on the nitrogen-potash line with straight nitrogen showing the highest yield. As in Plate 11 the second highest yield occurs at the 16-4-0 plot.

TABLE 10—Bubenzer Field, P.O.J. 36 1st. year stubble.

Pounds of Plant Food Constituent Per Acre N P K	Station Mill Analyses Brix	Sucrose	Purity	Tons Cane Per Acre	Pounds Sugar Per Ton	Pounds Sugar Per Acre	Rank
40–20–20	14.99	10.63	70.91	26.4	129.5	3,419	5
40–20– 0	14.29	9.77	67.95	26.3	115.8	3,046	6
40– 0–20	14.79	10.85	73.36	26.6	135.3	3,598	4
0–20–20	16.17	12.66	78.29	24.8	164.8	4,087	1
40– 0– 0	14.99	10.86	72.40	27.1	134.4	3,642	3
0– 0– 0	15.59	11.78	76.20	24.5	149.9	3,675	2

TABLE 11—Ellendale Field, P.O.J. 213 1st. year stubble.

Pounds of Plant Food Constituent Per Acre N P K	Station Mill Analyses Brix	Sucrose	Purity	Tons Cane Per Acre	Pounds Sugar Per Ton	Pounds Sugar Per Acre	Rank
40–20–20	15.61	12.66	81.10	28.7	168.2	4,842	1
40–20– 0	15.39	12.38	80.40	27.8	163.6	4,548	4
40– 0–20	15.50	12.71	82.00	28.2	169.8	4,788	2
0–20–20	15.47	12.76	82.48	20.7	171.1	3,542	5
40– 0– 0	15.68	12.99	82.97	27.4	174.7	4,787	3
0– 0– 0	15.75	13.02	82.66	19.5	174.8	3,409	6

TABLE 12—Upper Ten Field, P.O.J. 213 2nd. year stubble.

Pounds of Plant Food Constituent Per Acre N P K	Station Mill Analyses Brix	Sucrose	Purity	Tons Cane Per Acre	Pounds Sugar Per Ton	Pounds Sugar Per Acre	Rank
40–20–20	14.48	11.46	79.13	18.2	150.0	2,730	3
40–20– 0	14.62	11.62	79.47	18.5	152.5	2,821	1
40– 0–20	14.81	12.12	81.83	17.0	161.8	2,750	2
0–20–20	15.08	12.34	81.83	13.9	164.6	2,288	5
40– 0– 0	14.78	12.13	82.07	16.6	162.1	2,691	4
0– 0– 0	15.19	12.36	81.36	11.8	164.4	1,939	6

BUBENZER FIELD: Fertilizer applied April 15th, 1930. Sugar cane harvested December 9th and 10th, 1930.

ELLENDALE FIELD: Fertilizer applied April 7th, 1930. Sugar cane harvested December 3rd, 1930.

UPPER TEN FIELD: Fertilizer applied April 8th, 1930. Sugar cane harvested November 12th, 1930.

BUBENZER TEST FIELD

Bunkie, La.

The Bubenzer Test Field, Table 10, is situated about 2 miles north of Bunkie, La. It is on Yahola very fine sandy loam, an extensive type of that section (Page 8). The table differs from those in former pages in that the fertilizer formulas are in terms of pounds of plant food per acre.

The straight nitrogen application at the rate of 40 pounds per acre gave the best tonnage, whereas the mixture of 20 pounds of phosphoric acid and 20 pounds of potash made the largest gain in sugar per acre. While very little dependence can be placed in the 1929 results, due to freezes, it is interesting to note that the 1930 yields, which represent first year stubble, show a small increase in tonnages for all plots except check and the nitrogen free mixture. The rank of the 1930 results in terms of sugar per acre is given in the extreme right hand column.

ELLENDALE TEST FIELD

Houma, La.

In Table 11 the results of the Ellendale Field are given. This experiment is on Yazoo very fine sandy loam (Page 7) the most extensively developed soil type of the District. As in Table 6 the fertilizer formulas are stated in terms of pounds of plant food per acre.

The greatest return in tonnage and sugar per acre was from the complete fertilizer plot whereas 40 pounds of nitrogen and 20 pounds of potash gave the second highest yield. The return from the straight nitrogen plot is only 55 pounds less than the complete fertilizer mixture. In every case nitrogen shows a substantial increase over check. Comparing 1930 results with 1929 the check shows a 2.8 tons loss, the 40-20-20 a 4.1 tons increase, the 40-20-0 a 4.1 increase, 40-0-20 a 3.9 increase, the 0-20-20 an .8 ton loss and the 40-0-0 a 2.8 increase.

UPPER TEN TEST FIELD

Raceland, La.

The Upper Ten Field located near Raceland, La., is on Yazoo very fine sandy loam (Page 7). The second year stubble did not winter well and the stand was irregular and poor.

The fertilizer mixtures, Table 12, which are in terms of pounds of plant food per acre show the following results: The complete fertilizer mixture, nitrogen and phosphoric acid and the nitrogen and potash gave the highest yields though there is little to choose between the three. Straight nitrogen at the rate of 40 pounds per acre ranks forth and shows only 130 pounds less than the highest. These results, however, due to poor stand cannot be depended upon, and a comparison with the 1929 yield would hardly be justified.

RATE AND SOURCE OF NITROGEN

Since nitrogen is of tremendous importance in the successful production of sugar cane it was considered necessary to determine the most economic rates of application and study the effects of the more common nitrogen carriers.

In the spring of 1930 an extensive experiment was designed and laid out on Mandalay Plantation, near Houma, Louisiana. Four rates, 20, 40, 60 and 80 pounds of nitrogen per acre, of the more common carriers Sulphate of Ammonia, Cyanamid, Calcium Nitrate, Calurea and Nitrate of Soda were replicated twice. The experiment was placed on a very uniform body of Yazoo very fine sandy loam where the stand of sugar cane was extremely even so as to eliminate, as far as possible, all chances of error.

In Table 13 the 1930 results are given. The tons of sugar cane per acre show, in nearly every case, a steady increase up to applications of 80 pounds of nitrogen per acre whereas the pounds of sugar per acre indicate no economic return beyond the 40 pound

rate. It would appear, therefore, that applications of over 40 pounds of nitrogen per acre are of little economic value when this plant food element is used alone. It also seems that there is little difference in the action of the carriers. But the results represent only one year's work and the experiment will be continued in order that more data may be collected.

TABLE 13—Effect of various rates and source of nitrogen on 1st. year stubble of P.O.J. 213 cane.

Source	Pounds of Nitrogen Per Acre	Station Mill Analyses			Tons Cane Per Acre	Pounds Sugar Per Ton	Pounds Sugar Per Acre
		Brix	Sucrose	Purity			
Amon. Sulphate	20	15.61	13.11	83.98	27.8	177.6	4,937
	40	15.53	12.86	82.81	29.8	172.9	5,152
	60	14.90	11.37	76.31	28.8	145.5	4,190
	80	14.96	11.40	76.20	34.4	145.9	5,019
Cyanamid	20	16.13	13.88	86.05	24.5	190.6	4,670
	40	15.86	13.60	85.75	30.1	186.3	5,608
	60	15.12	12.35	81.68	27.6	164.7	4,546
	80	14.42	10.89	75.52	31.8	138.5	4,404
Cal. Nitrate	20	16.27	14.07	86.48	25.4	193.6	4,917
	40	15.74	13.16	83.61	30.9	177.8	5,494
	60	16.11	13.71	85.10	29.3	187.1	5,482
	80	14.66	11.41	77.83	32.8	147.9	4,851
Calurea	20	15.83	13.25	83.70	27.0	179.2	4,838
	40	15.82	13.42	84.83	27.3	182.7	4,988
	60	15.38	12.60	81.92	28.4	168.3	4,780
	80	14.77	11.62	78.67	33.3	152.3	5,072
Sodium Nitrate	20	15.97	13.70	85.78	25.4	187.7	4,768
	40	16.06	13.69	85.24	28.6	183.7	5,254
	60	15.52	12.68	81.70	29.5	169.3	4,994
	80	15.91	13.29	83.53	29.4	179.5	5,277
Average of 16 Check Plots..	–0–	15.69	13.21	84.20	20.8	179.1	3,725

Fertilizer applied April 10th and 11th, 1930. Sugar cane harvested November 24th and 25th, 1930.

CORRELATION OF SOIL TYPE, pH, TONNAGE AND SUGAR CONTENT

During the 1929 season 868 samples were collected from the principal soil types of the Sugar Cane District of Louisiana for pH determinations.[1] Except for the acid types Lintonia silt loam

(1) pH determinations were made at the Government Station, Houma, La. by Nelson McKaig, Jr.

and Olivier silt loam found in the terrace section at Lafayette, there was not a very close correlation between soil type and pH.[2] The general trend was interesting, however, and since the num-

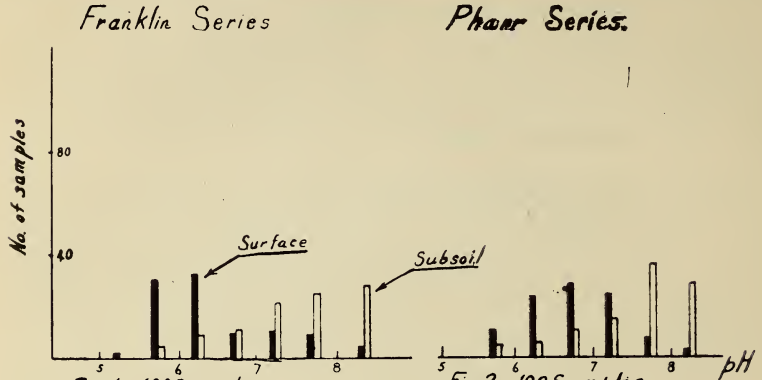


Fig 1 - 100 Samples
Sterling Plantation

Fig. 2 - 100 Samples
Sterling Plantation.

ber of samples was not sufficient to justify any definite conclusions it was deemed advisable to continue the work along broader lines.

The 1930 experiments followed a more definite plan and the various tests were designed to study not only pH reactions of certain given areas, but the effect of acidity and soil type on tonnage and sugar content.

The plan of the work consisted of an intensive study of small areas of the dominant soil types of each section. The results are

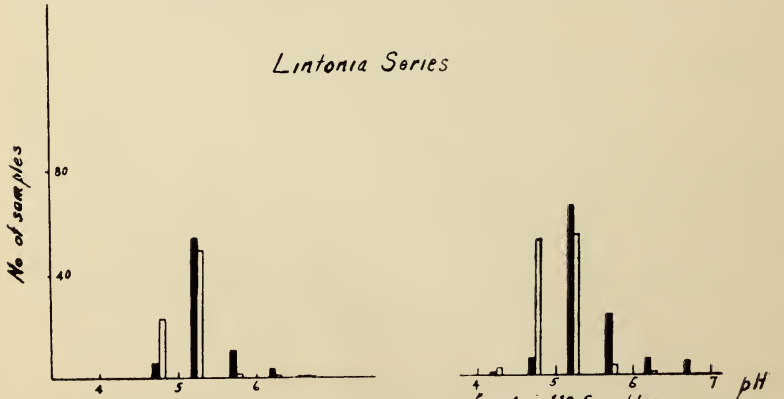


Fig 3 - 75 Samples
Roy Plantation

Fig. 4 - 110 Samples
Random over Cane Belt

given in Tables 14 and 15, and shown graphically in Figures 1 to 10. In each case these areas were selected for uniformity of

(2) pH made by Quinhydrone method using M/20 potassium phthalate-quinhydrone as a reference half cell having a value of pH 3.98.

soil type and sugar cane stand. The same variety of cane was used. Surface samples were taken from 0 to 8 inches and the subsoil from 10 to 24 inches.

The results of the one year's work, as set forth in Table 15, seem to indicate that no dependence can be placed in the effect of pH on tonnage and sugar content. At both Cinclare and Race-

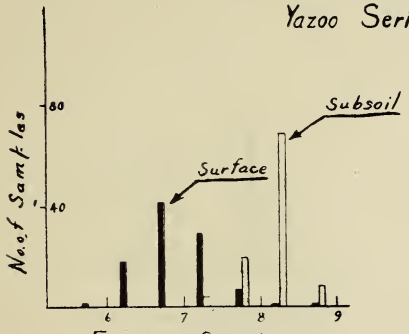


Fig. 5 - 100 Samples
Cinclare Plantation

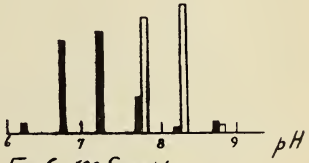


Fig. 6 - 100 Samples
Mary Plantation.

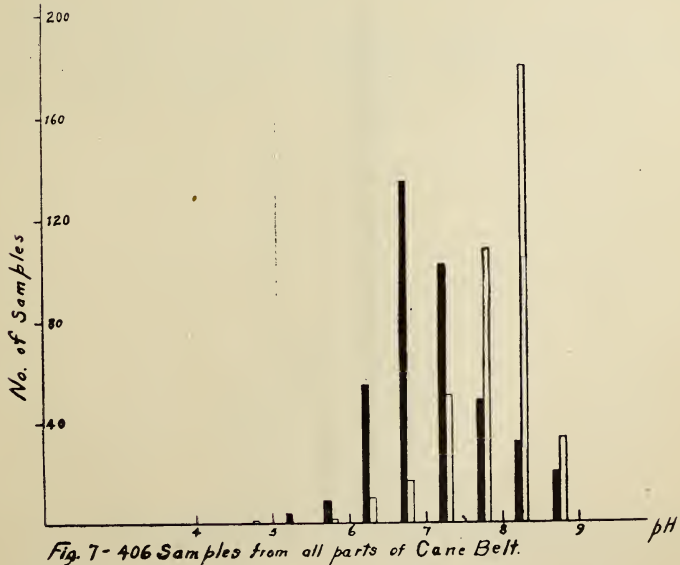


Fig. 7 - 406 Samples from all parts of Cane Belt.

land the light textured types gave the highest yields as was expected, but at Franklin, which is within the limits of the Missis-

sippi-Red River area, the heavier soil shows the high return. Again at Lafayette an acid soil shows the highest yield. Apparently acidity is not the whole story.

In Table 14, which gives the location, number and pH range of the different samples, there is a very definite trend shown when

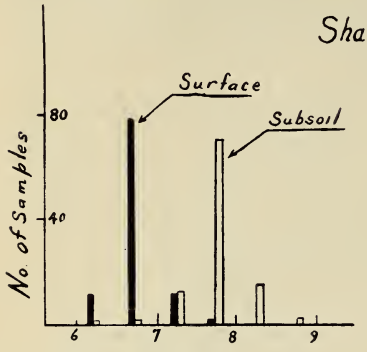


Fig. 8 - 100 Samples
Cinclare Plantation

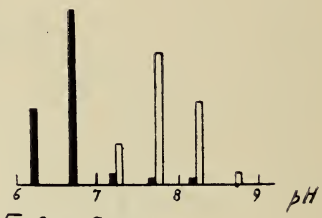


Fig. 9 - 100 Samples
Mary Plantation

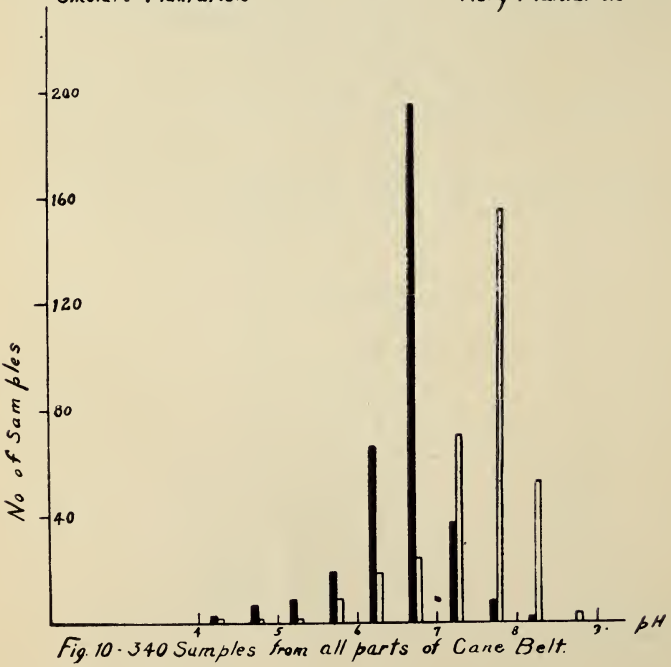


Fig. 10 - 340 Samples from all parts of Cane Belt.

the same soil types collected from widely separated points in the same major soil area are compared. For instance, the Sharkey

silty clay samples collected from Mary Plantation, Raceland, and Cinclare Plantation, Cinclare, points approximately 100 miles apart, have much the same pH range. Even when 240 random samples from all parts of the section are included, no change is indicated other than a few more extreme points. This is shown more clearly in Figures 8 to 10.

The Yazoo very fine sandy loam, silt loam and loam samples from Mary and Cinclare show much the same trend. The curves are uniform, Figures 5 to 7, but differ from the Sharkey in that the peak is not so sharply defined.

The soils of the Franklin series, which are developed in the Mississippi-Red River Area, have many of the same profile characteristics as the Yazoo. It is interesting to note, however, that the pH range is acid instead of alkaline. In Figure 1 it will be observed that 64 surface samples out of the hundred fall within pH 5.50 and 6.50 range. The surface curve flattens out gradually on the alkaline side with a number of overlaps. The subsoils are alkaline without any sharp trends.

The 100 Pharr silt loam and silty clay loam samples do not show any marked correlation.

The Lintonia silt loam gives a rather striking correlation which is more outstanding when the samples are from restricted areas. Figs. 3 and 4.

TABLE 14

Soil Type	Location	Horizon	No. Samples	Number of Samples Between pH Intervals										
				4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00
Sharkey Silty Clay	Cinclare Pltn. Cinclare, La.	Surface	100	.....	.....	.....	.....	11	77	11	1	.....	.....	.....
		Subsoil	100	.....	.....	.....	.....	1	1	12	69	15	2	.....
Sharkey Silty Clay	Mary Plantation Raceland, La.	Surface	100	.....	.....	.....	.....	28	66	4	1	1	.....	.....
		Subsoil	100	.....	.....	.....	.....	.....	.....	15	50	31	4	.....
Sharkey Series	Random Samples	Surface	340	2	5	8	19	66	195	37	7	1	.....	.....
		Subsoil	340	1	1	1	8	18	24	71	156	53	6	.....
Yazoo v. f. s. Loam and Silt Loam	Cinclare Pltn. Cinclare, La.	Surface	100	.....	.....	.....	1	18	42	30	7	1	1	.....
		Subsoil	100	.....	.....	.....	.....	.....	.....	4	20	68	8	.....
Yazoo v. f. s. Loam and Silt Loam	Mary Plantation Raceland, La.	Surface	100	.....	.....	.....	.....	4	36	40	14	2	4	.....
		Subsoil	100	.....	.....	.....	.....	.....	.....	.....	46	51	3	.....
Yazoo v. f. s. Loam and Silt Loam	Random Samples	Surface	406	.....	.....	4	9	55	135	103	48	32	20	.....
		Subsoil	406	.....	1	.....	2	11	17	51	108	182	34	.....
Franklin v. f. s. l. and Silt Loam	Sterling Pltn. Franklin, La.	Surface	100	.....	.....	2	31	33	10	11	9	4	.....	.....
		Subsoil	100	.....	.....	.....	5	9	12	22	25	27	.....	.....
Pharr s. l. and Silty Clay Loam	Sterling Pltn. Franklin, La.	Surface	100	.....	.....	.....	12	24	29	25	7	3	.....	.....
		Subsoil	100	.....	.....	.....	5	6	10	15	36	28	.....	.....
Lintonia Silt Loam	Roy Plantation Lafayette, La.	Surface	75	.....	6	54	11	3	1	.....	.....	.....	.....	.....
		Subsoil	75	.....	23	49	2	1	.....	.....	.....	.....	.....	.....
Lintonia Silt Loam	Random Samples	Surface	110	1	7	66	23	7	6	.....	.....	.....	.....	.....
		Subsoil	110	3	50	53	3	1	.....	.....	.....	.....	.....	.....

TABLE 15

Soil Type	Location	Average pH of Surface Soil	NORMAL JUICE			Tons Cane Per Acre	Lbs. Sugar Per Acre
			Brix	Suc.	Pur.		
Sharkey Silty Clay	Cinclare Plantation Cinclare, La.	6.76	14.23	10.65	74.84	15.3	2,058
Yazoo v. f. s. Loam	Cinclare Plantation Cinclare, La.	6.90	13.76	9.01	65.48	24.1	2,482
Sharkey Silty Clay	Mary Plantation Raceland, La.	6.65	13.31	9.41	70.68	19.4	2,159
Yazoo v. f. s. Loam	Mary Plantation Raceland, La.	7.18	13.98	10.59	75.68	25.3	3,416
Pharr Silty Clay Loam	Sterling Plantation Franklin, La.	6.74	16.78	13.38	79.75	20.2	3,563
Franklin v. f. s. Loam	Sterling Plantation Franklin, La.	6.61	16.89	13.70	81.11	17.8	3,241
Lintonia Silt Loam	Roy Plantation	5.34	15.78	12.43	78.77	26.2	4,255

CARRY OVER EFFECT OF FERTILIZER FROM ROW TO ROW

Field observations indicate that where plots treated with different fertilizer mixtures are laid out without intervening buffers the outside rows of each plot show the effect of the adjoining mixture. But there are no data available to prove the extent of this influence and the number of buffer rows necessary.

Since such information is important an experiment was designed and laid out as shown in Figure 11. Each plot is 20 feet long and 8 rows wide. Two plots received 60 pounds of nitrogen per acre and two 120 pounds. In each case the fertilized plots are separated by checks. At harvest the sugar cane on each row was cut and weighed separately.

In Table 16 the average of the rows 1 and 8, 2 and 7, 3 and 6, and 4 and 5 of the checks and fertilized plots are shown. Rows

1 and 8 of the checks adjoin 1 and 8 of the fertilized plots whereas 4 and 5 are the center rows of each plot. In other words rows 4 and 5 should represent the true condition of each plot whether check or fertilized.

An analysis of the results in Table 16 shows that rows 2 and 7, 3 and 6, and 4 and 5 for check 1 and 2 gave practically the same weight whereas the outside rows which are next to the plots that received 60 pounds of nitrogen per acre are distinctly heavier. The same is true of the check plots 3 and 4. In the case of the outside rows of the 60 pound plots the decrease in weight is not as marked as might be expected. This also holds true where 120 pounds of nitrogen per acre was applied. These results are shown more clearly in the graphs, Figures 12, 13 and 14.

The results of this experiment indicate that only the outside rows of the plots are effected, the fertilized rows negatively and the checks positively. It should be borne in mind that these results are on one year's work.

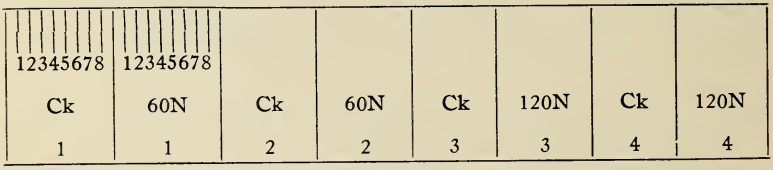


Fig. 11—Plot arrangement of carry over effect experiment.

TABLE 16—Showing weight of cane per row using pairs of the opposite rows in each plot.

Plots	ROWS			
	1 and 8	2 and 7	3 and 6	4 and 5
Checks 1 and 2	132	129	122	128
60 N—1 and 2	216	215	206	220
Checks 3 and 4	141	118	124	110
120 N—3 and 4	192	206	190	200
Average of Checks	137	123	123	119
Average of Fertilized plots	204	211	198	210

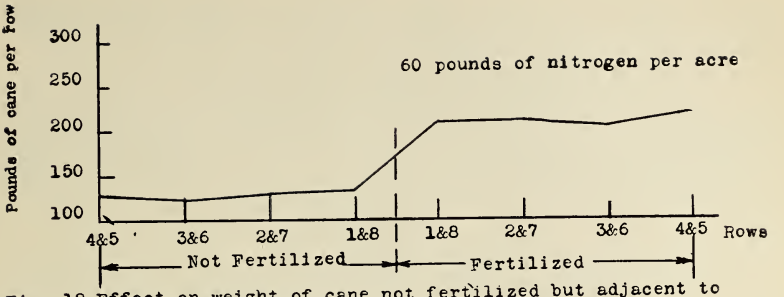


Fig. 12 Effect on weight of cane not fertilized but adjacent to fertilized plots.

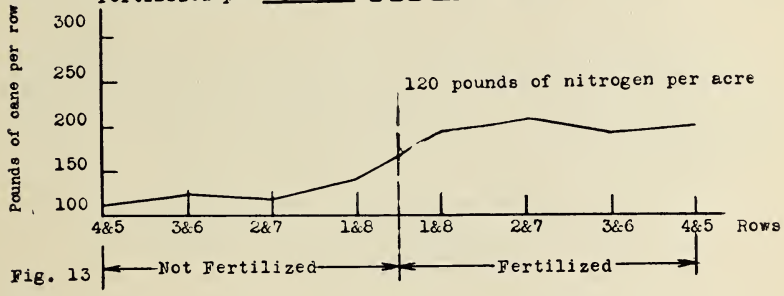


Fig. 13

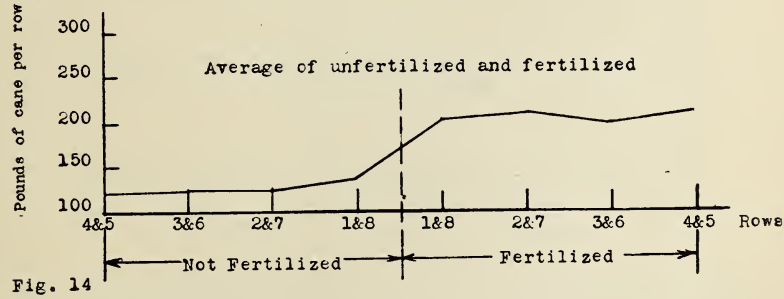


Fig. 14

APPENDIX

In all the triangle experiments the formulas are in terms of per cent of the principal plant food elements nitrogen, phosphoric acid and potash. They may be converted into pounds of the plant food elements as follows:

Let us assume that the mixture 12 per cent nitrogen, 4 per cent phosphoric acid, 4 per cent potash is to be applied at the rate of 60 pounds of plant food per acre.

The mixture stated in terms of plant food per acre would be 36 pounds of nitrogen (N), 12 pounds of phosphoric acid (P_2O_5)

and 12 pounds of potash (K_2O) arrived at in the following manner:

$$\frac{\text{per cent of each of the plant food elements}}{\text{sum of percentages of the plant food elements}} \times \text{total plant food wanted per acre}$$

or

$$\frac{12}{20} \times 60 = 36\ N, \quad \frac{4}{20} \times 60 = 12\ P_2O_5 \quad \text{and} \quad \frac{4}{20} \times 60 = 12\ K_2O$$

Assuming the nitrogen source to carry 16 per cent N, the superphosphate 16 per cent P_2O_5 and the muriate of potash 50 per cent K_2O the pounds of the different materials can be calculated as follows:

$\frac{36}{16} \times 100 = 225$ pounds of any 16 per cent nitrogen fertilizer.

$\frac{12}{16} \times 100 = 75$ pounds of any 16 per cent superphosphate fertilizer.

$\frac{12}{50} \times 100 = 24$ pounds of any 50 per cent potash fertilizer.

324

Therefore a 12% N, 4% P_2O_5, 4% K_2O mixture requires 324 pounds of a mixed fertilizer with the above plant food guarantees, to supply 60 pounds of total plant food per acre.

Literature Cited:

(a) The Triangle System of Fertilizer Experiments is explained in an article by Oswald Schreiner and J. J. Skinner in Journal American Society of Agronomy, Vol. 10, pages 225-246, (1922).

(d) U. S. D. A. Circular No. 418, R. D. Rands and S. F. Sherwood.

Acknowledgments:

The success of the experiments reported in this Bulletin was due, in large measure, to the splendid co-operation of:

L. A. Hurst, Division of Soil Investigations, Bureau of Chemistry and Soils.

W. G. Taggart, Ass't Director, L. S. U. Experiment Station.

Est. Harry L. Laws, Cinclare, La.

Percy Lemann, Donaldsonville, La.

Godchaux Sugars, Inc., Raceland, La.

Est. H. C. Minor, Houma, La.

Sterling Sugars, Inc., Franklin, La.

J. A. Roy, Lafayette, La.

H. K. Bubenzer, Bunkie, La.

Andrew McCollum, Houma, La.

Nelson McKaig, Bureau of Chemistry and Soils, Houma, La.

George Arceneaux, Bureau of Plant Industry, Houma, La.

U. S. Weather Bureau, New Orleans, La.